Land and Water in the Era of Mexico's Neo-Liberal Counter Reform: Case Studies from the N. E. of the State of Mexico

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Draft: Not for citation

Paper to be presented to Working Group 4, International Rural Sociological Association meetings, July, 2004 - Trondheim, Norway.

Land and Water in the Era of Mexico's Neo-Liberal Counter Reform: Case Studies from the N. E. of the State of Mexico[1]

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Despite high rates of urbanization in recent decades, it has been argued that almost 40% of Mexicans today still get their livelihood from the countryside and activities based there (Zorilla Ornelas 2003 #90:74} . It is of no small significance then that Mexico's long and complicated history of agrarian reform and land redistribution appeared to have come to a definitive end in 1992 with the changes to Article 27 of the Constitution by the Government of Carlos Salinas de Gortari. This piece of legislation, which owed its genesis to the social powers unleashed by the much fabled agrarian revolution of 1910, had provided the legislative context for the emergence of the *ejido* as the leitmotif of rural Mexico. This form of land tenure with its communal features had roots in both pre-Hispanic meso-america and in medieval Spain. Its non-capitalist features, including the prohibition on sale and renting of land, and the communal dimension to the communities built around it, were anathema to the contemporary architects of neo-liberal Mexico. The revision of Article 27 was felt by many to be an attack on the ejido itself, and a clear attempt to extend full blown capitalist social relations into the countryside. There were

many predictions about the fall-out from the neo-liberal "reforms", or what are perhaps more accurately labelled as counter-reforms to the revolutionary project begun decades ago. This paper attempts to contribute to the broader effort to make sense of the impact of far-reaching legislative changes that have impacted the rural sector, and the *ejido* sector in particular. It reports on in-depth fieldwork in two ejidal communities in the State of Mexico, near the city of Texcoco, and brings forward evidence on land use changes and impacts on local water resources. It assess what the relationship of the changes witnessed might have to the broader agenda defined by the neo-liberal project, and transformation of Article 27 of the Constitution in particular.

Article 27: Its Genesis, Detractors and Protagonists

Ibarra Mendívil has noted that Article 27 of the Constitution of 1917 was 'the most solid legal support of Mexican agrarian reform' (Ibarra Mendivil 1996 #10:51). It lay the basis for transforming agrarian relationships in a number of ways:

(i) it established the nation as the original owner of lands and water within national territory. The nation was recognized as the original community then, within which individual and community rights take form. Public or collective interests could take precedence over the rights of private property (see Toledo 1996 #20:254)

(ii) it sanctions the right of the Mexican state to take lands from estates that exceed the landholding limits set for small property, in order to restore lands to indigenous people and provide landless rural people with land;

(iii) *ejidal* land is recognized with specific rights and restrictions over sale, and renting of

land;

(iv) the law establishes the right of the executive power of the State to intervene and mediate around *ejidal* land (Ibarra Mendivil 1996 #10:53-4). It was not surprising then, that upon taking control of the federal Mexican State, proponents of a minimalist role for government were keen to revise rather radically the existing legislation contained within Article 27. They were to find powerful allies, both internally, and among powerful external actors including the World Bank. Mexico's high degree of indebtedness to foreign lenders also played a role in giving external actors favouring a neo-liberal counter reform in Mexico extraordinary influence (Lopez Gamez 2001 #60:23).

As argued by de Janvry, Gordillo and Sadoulet (1997 #30:11), promoters of "reform" to Article 27 argued it would end long-standing state paternalism towards the rural sector and help to free the *ejido's* production potential and create a market for land. They believed the further integration of the *ejido* into the market would make producers more responsive to "market signals", boosting productivity and allowing the most efficient to expand while the less efficient would "choose" to leave agriculture (World Bank 2001 #50). Furthermore, by freeing up the productive potential of agriculture through elimination of the structural barriers to capital accumulation, it was felt that foreign capital could be attracted to invest in the rural sector and further stimulate economic growth (Randall 1996 #100; Ovalle Vaquera 1998 #70:87). Finally, even some of those with a more critical assessment of these changes agreed that there was fairly widespread abuse of the *ejido* system in term of meeting membership obligations proscribed by law, and with regards to renting and sale of land, while *ejiditarios* were used for many years by the governing party

to maintain itself in power (see Yetman 2000 #110:216).

Among critics of changes to Article 27 were those who argued that it is but one part of a wider agenda promulgated through the NAFTA agreement by Governments, and by powerful transnational corporate actors, particularly in the agribusiness field (see Lopez Gamez 2001 #60: 23)[2]. The changes have been seen as a key step to win over American negotiators of a free trade agreement that Mexico was opening up its vast agrarian sector to private investment, and also as a security blanket to large Mexican landowners fearful of the provisions for expropriation contained in the original revolutionary agrarian law (Yetman 2000 #110:212,217).

And, as Lopez and Ovalle pointed out, the far reaching changes to Mexico's political economy in the early 1990's sought to favour Mexico's production of fruit and vegetables, while putting Mexican grain producers at a comparative disadvantage compared to U.S. producers. They point out that only a tiny fraction of agrarian producers, about 22 thousand or less than .5% of all producers (with only 5% of all irrigated land), would benefit from the export of vegetables and fruit, compared to several million producers of grain disadvantaged by NAFTA (Lopez Gamez 2001 #60:32). This was because of the removal of tariff barriers to subsidized American corn would inevitably lead, it was argued, to an influx of cheap corn that will undercut the bulk of agrarian producers that depend upon the production of this mainstay of the Mexican diet. Overall, opponents of the changes produced by the neo-liberal reforms argued that the freeing up of a market in land would exacerbate inequalities, already considerable in Mexico, and produce even higher rates of poverty (Lopez Gamez 2001 #60:32-3).

Land Tenure Changes and the Environment:

Before considering the evidence that has emerged, and how it supports one side or the other, it is necessary to consider one more dimension of the current transformation of rural Mexico: the rural environment. The legislation that swept in changes to Article 27 in 1992 contained little that would protect the environment, or lead to a regeneration of its capacity to sustain life (Toledo 1996 #20:254) despite the fact that proponents had argued that reform of the ejido sector was necessary because of the damage the ejido form of land tenure had purportedly done to nature (Barton Bray, 1996:215-216). However, additional laws covering water and forests did have more environmental relevance. As Barton Bray notes (1996 #80:217), 'the water law proclaims its intention to contribute to sustainable and integral development, places the concept of watershed management in the forefront, and establishes watershed councils for citizen participation.'

Next to the struggle for land, the matter of water, and deciding who has control over it, has been the next most critical resource issue faced by rural Mexicans. By the 1990's only 27% of Mexico's agricultural land was irrigated, but 50% of agricultural produce came from this land (Whiteford and Bernal, 1996:224). In the period after the revolution legislation had placed water under the control of the state, ostensibly to be managed for the social good of the nation. Massive infrastructure projects were undertaken, particularly in the North, to irrigate fertile soils lacking access to regular water supplies. As Whiteford and Bernal note ( ), while state subsidies to users were relatively modest through the 1960's, by the late 1980's state subsidies accounted for about 85% of the cost. In addition,

infrastructure was deteriorating, much land was being taken out of production because of excessive salination, and water resources were generally becoming degraded by such contaminants as industrial and municipal waste, and chemical runoff from intensive agricultural operations. This was an important part of the context for the new Ley de Aguas Nacionales of 1993.

Integral to this new law was the transfer of management of irrigation districts from state hands to those of local users. With *la transferencia*, new civil associations have been formed constituted by all irrigators within a specific area, or *modulo*. They have been handed responsibility for operating, conserving, and administering water allocation, and with maintaining local infrastructure. The immediate economic impact comes from the fact that the state, with this new legislation, no longer subsidises water, and producers are faced with meeting a much greater cost for access to water than before (Whiteford and Bernal, 1996:226-7).

The law affecting forests has equally lofty stated objectives, in its pretensions to "conserve, protect, and restore the forest resources and the biodiversity of their ecosystems, ...[and] achieve a sustainable management of the forest timber and non-timber resources, contributing to the economic development of the *ejiditarios*, *comuneros*, and other owners and possessors of said resources, without reducing the capacity of nature to regenerate.' (cited in Barton Bray 1996 #80:216)

Inherent in the new legislative regime, however, is the reliance on the mechanism of the market to achieve these laudatory environmental goals. While transfer of control to the local level has the potential to ensure more responsible use of local resources and end

abuses that occurred with federal state policies, it also opened the way for local manipulation of resources to benefit a few, particularly where considerable local inequalities in economic resources, and hence, political power, already exist. Moreover, the overall bias of legislation towards a productive regime favouring the production of food and materials at the lowest possible price, with minimal state intervention, is viewed by some as a "bias towards the strong", one that will favour capital intensive, highly mechanized, large scale agriculture oriented towards monoculture and utilizing relatively high levels of pesticides and herbicides (Toledo 1996 #20:258) . How this is supposed to benefit the environment is an open question.

A Decade Later: Debate on the Impact:

A decade after the changes were made, proponents from the Mexican Government and the World Bank argue that the changes have had positive effects in a number of areas. Among the benefits they argue were achieved through reforming Article 27 are the following: improving equity through increased access to land and provision of more secure tenure rights; improved governance and transparency at the grass roots level; improved access to common property resources, particularly land; increased household welfare by allowing increased access to off-farm markets; improved functioning of land markets and; greater social peace in the countryside (World Bank 2001 #50:viii).

This rosy assessment of the neo-liberal policy impact with respect to Mexico's rural sector has been challenged, in whole or in part, by a varied group of critics. De Janvry et al., (1997 #30), while in agreement with some important aspects of the neo-liberal agenda with regards to Mexico's *ejido* sector, draw from their important empirical study of the

early years of Salinas's neo-liberal program to criticize the almost total lack of institutional support for the reformed *ejido* sector. This privatization, scaling down or liquidization of many of the public institutional supports of this sector led, together with adverse macro-economic conditions, to the *ejido* sector, in their words,

> 'going through a profitability crisis and a serious process of productive and social decapitalization. This crisis threatens the very permanence of many households in this sector. ...Credit for investment, which is essential to support the productive reconversion of the *ejido*, is almost non-existent. ...Access to formal insurance has virtually disappeared (de Janvry 1997 #30:201-2).

Both they and Lopez and Ovalle (de Janvry 1997 #30:75-81; Lopez Gamez 2001 #60:47-8) present data to show that the use of a variety of agricultural inputs by *ejiditarians* fell quite substantially, as agricultural credits dried up. In the early cheap subsidized American corn began pouring into Mexico as well, with imports rising from 1.7 to 5 million tons between 1994 and 1996 alone (Lopez Gamez 2001 #60:42).

As de Janvry et al. (de Janvry 1997 #30:81) argue, the impact on the small producers in the *ejidal* sector was mitigated by the fact that the majority of farmers (approximately 60%) are subsistence producers of corn, or have recourse to buy corn and so were unaffected directly or marginally benefited from cheap imports. For the forty percent who were sellers of corn, it was another story.

The World Bank itself (World Bank 2001:3-5) admitted that rural income inequality has increased in the latter part of the 1990's, with the Gini coefficient shifting from .45 in 1996 to .48 in 1998. The incidence of rural poverty in Mexico stood at 85% by the turn of

the century, with 56% of rural Mexicans facing "severe poverty", meaning they cannot meet basic nutritional needs. This compares with 16% in such a condition in urban areas.

With these indicators of a growing rural crises, it was not surprising that migration, especially *international* migration became an even stronger feature of the Mexican countryside, and while only 3% of *ejido* families had a migrant member in 1993, this figure was 8% in 1997 (Zorilla Ornelas 2003 :79).

With respect to more structural changes in agriculture, there was some evidence of the growth of a land market in the 1990's, and an increase in renting of land by more capitalized growers (Ovalle Vaquera 1998:101). Renting of land has increased concentration of land on non-certified *ejidos*, but lessened it on certified ones, while there was no significant increase in land sales by *ejidos* except in peri-urban areas (World Bank 2001 #5043-4).

Fears about impoverished *ejiditarios* being forced to sell their land to outsiders and thereby opening the door to a re-concentration of land in Mexico do not appear to have been borne out, at least not in the short term and not for the majority of *ejiditarios*. Nevertheless, there are reports of increased selling and renting of land among *ejiditarios* themselves in some states such as Sonora, and a process of land concentration occuring in this manner (Yetman 2000:223). Small holders in peri-urban areas were an exception to the above, to some degree, as more evidence exists of increases in land sales to outsiders. To the extent that the privatization process was carried through to its conclusion, and full private ownership obtained, it was more likely to be in areas closer to urban expansion (Jones and Ward, 1998; World Bank 2001:43-4). Indeed this outcome was promoted by the

land titling process itself, which goes under the acronym of PROCEDE, which provides a "fast track" by which urban *ejidos* can be privatized (Pisa 2001:5).

The land titling process has proven to overwhelm authorities, and ten years after its initiation (1993) several thousand of the approximately 30 thousand *ejidos* had not been certified by PROCEDE (Zorrilla Ornelas 2003a:77). It is now apparent that there were insufficient trained personal to properly explain the complexities of the process to *ejiditarios*, or to carry out the massive land surveys needed. Confusion about the process was reported by various observers (Yetman 2000:222). Moreover the Mexican state has severely limited funding to the titling process in recent years of financial crisis (Zorrilla Ornelas 2003b:111).

Of those *ejidos* that had proceeded with the titling process, very few had opted for the full privatization of their land, or what is referred to as *dominio pleno* (less than 1 percent by 1998). Part of the reason for this was no doubt the fact that for the majority there were not buyers pressuring them to sell their land at attractive prices, given the severe agrarian recession through much of the 1990's, and given the marginal nature of much *ejidal* land in the first place. Moreover, one land had been fully privatized it was vulnerable to taxation and other charges by the state, reducing the attractiveness of pursuing *dominio pleno* unless some clear pecuniary gain was expected. Changes on the land tenure front were more apparent in the conversion of **common lands**, however. Based on a survey of *ejidos* conducted in the late 1990's, Davis (2000:104) argues that vast tracts of common pasture and forested land came under individual control, both formaly and informally between 1994 and 1997.

It has been argued by Pisa (2001:) that the titling process which was ostensibly implemented to allow full-blown privatization of *ejido* land so that it could be bought and sold like any other commodity in the marketplace, was structured in such a way that numerous obstacles were put in place that obstructed such an outcome. Moreover, even when *ejditarios* had jointly agreed to follow through to convert their land to *dominio pleno*, the state bureaucracy still had the power to delay and manipulate the final issuing of titles so that powerful private buyers, or the state itself, would have advantage over those smallholders wishing to sell their land at the best market price. In this view, the form that was taken by the land titling process, PROCEDE, can be understood as a reflection of the various contradictions inherent in the wider Mexican power structure, and notably the struggle between factions favouring agrarian interests, on the one hand, and those favouring capital via new-liberal policy agenda, on the other.

For one reason or another, there would seen to be good evidence to conclude that now ten years later, the achievements of the neo-liberal policy thrust that changed Article 27 have been rather limited. As one observer relatively sympathetic to the idea of reforming the *ejido* has recently put it,

> The poverty and the misery, the high rate of illiteracy and the low levels of rural
>
> schooling, the bad health, infant malnutrition, and the high indices of infectious
>
> diseases have hardly diminished in the last decade of the twentieth century. The

> land market is nearly inexistent and means to strengthen it and give it viability are lacking, and private investment is small and continues to be limited. In 12 years of supposedly structural change the results are so small that one can affirm without exaggeration that in fact they are non-existent (Zorrilla Ornelas 2003b:111).

It is not surprising then, that some proponents of change, perhaps despairing of the institutional failures in delivering the fruits of neo-liberal reform, have turned their attention to the role of off-farm income in bringing about positive rural development (de Janvry 2001). Clearly there is some room for debate here, and we may agree with Zorrilaa Ornelas (2003b:111) that it is still early to form a complete evaluation of this attempt to reconfigure the Mexican countryside. It is with this assessment in mind that we turn to our empirical study to two *ejido* communities that lie in the north east of the state of Mexico, near the city of Texcoco.

While these macro level studies do provide us with some initial trends that have emerged in the new institutional environment of rural Mexico, they have their limitations and largely fail to provide insights into the texture of rural social change at the local level. The remainder of the paper considers the insights to be gained into the process of rural change in the era of neo-liberal reforms from an in-depth study of two *ejidos* in the state of Mexico. In particular, it considers the ecological impact of these changes.

Community Case Studies in the Cuenca de Texcoco:

The *ejidal* communities of San Pablo Ixayoc and San Diego Tlaylotlacan lie in the Texcoco valley, not too distant from the city of Texcoco, itself one hours drive east from Mexico City. The former was founded in 1924, the latter much earlier in 1707. Each has been affected by the broader changes in the north east Valley of Mexico in recent years.

Among the most notable of these changes include massive land use changes, as some 45% of agricultural land has gone into urban uses between 1976 and 1996. Of the 21 ranches with 30,000 head of cattle in the 1940's, only 2 ranches with 2000 head existed by the year 2000. Changes were reported to be much greater on private land than on *ejido* land. (Muro Bowling).

Demographic change in this region has been dramatic, with rates of increase among the highest in Mexico - 7.7% annually for the municipality of Texcoco. There have also been massive occupational changes as well. There was 75% of the economically active population engaged in agricultural pursuits in the 1960's, but only 25% by 1996, for instance (Muro Bowling).

Muro Bowling and others report a number of increasingly serious environmental issues emerging in the region. These include the degradation of local rivers with a reduction in their flow, rampant contamination with untreated sewage and their use as dumping grounds for community garbage. The author's own observations between 2001 and 2003 confirm these observations. Muro Bowling also mentions the depletion of the aquifer in the Valley with a drop of 1.7 metres annually and the advance of saline waters from the lake area of the Valley of Mexico into the aquifer. Zaldivar (1998:160) argues that

the agricultural areas have increasingly relied on irrigation wells and the rising rate of water extraction since the 1970's for agriculture and urban use will eventually put at risk the sustainability of water resources.

The Study.

The purpose of our study was to find out whether the reform of Article 27 accelerated transformations in ejido structure and organization, put additional pressure on water resources, and affected local people's livelihoods. The communities that were the subject of our fieldwork were located in the Texcoco river watershed.. They were selected because they share the waters of the same river but are located at different altitudes: San Pablo is between 2,500 and 3,900 meters above the sea level and receives an average of 1,000 mml of rain a year, while San Diego is located at 2,250 to 2,300 meters above the sea level and receives 800 mml of rain a year (Palma, 2000:25-29

The research team consisted of two Canadian rural sociologists, a Canadian graduate student, a Mexican anthropologist and a Mexican graduate student. Part of the research consisted of interviews with a sample of *ejiditarios* and private property holders randomly chosen from a complete list of all *ejiditarios* and individual property holders in each community. Female *ejiditarios* were over-sampled to ensure their representation in the sample. Face to face interviews were conducted in 2002-3 with respondents by a Mexican graduate student having a good familiarity with local conditions and lasted approximately an hour to an hour and a half each. Additional information was collected by the project team through interviews with personnel of what is the equivalent to a board of

directors of each ejido, through on-site visits, and via archival research in libraries at the Colegio de Posgraduados and the Universidad Autónoma Chapingo.

San Pablo Ixáyoc

The Texcoco region was inhabited by approximately 30,000 indigenous people before the arrival of the Spaniards. It was very fertile due to its proximity to several rivers which ended in the Texcoco lake as well and to forest mountains with cedar, pine, 'ayamel', and 'sauce' . After the Spanish invasion, Hernán Cortés, its military leader, acquired the city of Texcoco as an encomienda and received tribute from its population until 1536. Shortly after (1541) it was transferred by order of the Virrey Mendoza to the Church (González, 1996:47-53).

San Pablo was part of the famous and large Chapingo hacienda which was formed during the sixteenth century and was dissolved soon after the Mexican Revolution of 1910 to favor the creation of the National School of Agriculture and the constitution of ejidos with the remaining lands. At the end of the nineteenth century the hacienda encompassed more than fourteen hectares which had been bought from previous private owners or taken away from native communities (González, 1996:1978-1981). As soon as Carranza decreed the end of haciendas in 1915, the people of San Pablo started to ask for the restitution of their lands and waters. This community became one of the first ejidos in the country when in 1923 it was provisionally granted 200 hectares of land. Two years later, in 1925, the definitive grant (dotación definitiva) added 200 to the provisional one, for a total of 400 hectares. However the quality of land was not good, as stated by the comisariado ejidal in a letter

addressed to the Agrarian Communities League in 1930: 215 hectares are "useless" monte which the previous owner "finished off"; 100 are tepetate (eroded land) and the remaining 85 are "second hand" arable lands.[3] Eighty six people were benefitted with land distribution, each one receiving less than an hectare, given the creation of the school parcel. Thus, ejidatarios applied for an extension (ampliación) of their ejido and additional 496 hectares of forests were granted in 1938. According to Palma (2000:29), the community now has a total of 888 hectares, 576 of which are forests and 312 are devoted to agricultural and urban activities. Private property makes up a total of 118 hectares. [4] The current number of ejidatarios is 123 (Flores, 2000:32).

The population of San Pablo has grown during the second half of the twentieth century from 450 inhabitants in 1970 to 1,702 in 1999 (Table 1). This represents an increase of 278% in 29 years (Palma, 2000:28). As will be seen shortly, the percentage is lower than in San Diego because access to San Pablo is difficult and not too many people moving to the Texcoco region have chosen that community as a place to live. Still, people in San Pablo perceive population growth as one of the most important factors causing environmental degradation in their community (Canahua, 1986).

Major crops in SPI are rain-fed corn and beans. However, soil erosion is severe and some people use terraces to increase productivity.[5] Flowers such as cempoalxochiltl, agapando, margaritón, lili and crisantemo are cultivated for the regional and Mexico City markets. Some people also own small numbers of dairy cattle for self-consumption of milk and cheese (Palma, 2000:27; Mata et al, 1998:47).

Rivera and Palma (2000) have noted the existence of family gardens in San Pablo..

According to Rivera, these are significantly larger than those of other communities of the watershed, although not as diverse. Ornamental plants and fruit trees tend to predominate and family gardens have lost their economic and cultural importance since they are no longer sites of local germoplasm conservation. The author attributes such state of affairs to several factors, including lack of water, lack of space, migration and urbanization (Rivera, 1999:90).

Wood for fuel and construction purposes is extracted from the community forests. According to one informant, close to forty per cent of all households use wood to cook some meals, even if they have a stove. Up to the late seventies, when stoves became more common, many people sold firewood in nearby villages and some continue doing so, to the extent that Martínez (2000) defines the people of San Pablo as leñadores. Fungi are also collected for self-consumption and some families (five according to one informant) also sell them for a living. Other produce such as musgo, heno, varas de cedro and pine trees are collected and sold during the Christmas season for nacimientos and Christmas trees. However as of 2001 the ejido assembly decided to forbid the extraction of forest resources due to a severe fire that happened in 1998. Many interviewed people told us that the ban will end in 2006, although no agreement was found on exactly what kind of products are forbidden to collect. Some said that only musgo while others also mentioned heno and fungi. We also heard that people were going to the forests of other ejidos (Tequexquinahuac, Nativitas, San Dieguito) to get these products or even that they extracted them from the community's forests illegally. It seems that people are not well informed and some of them do not even agree with the restrictive measures to prevent the

extraction of forest resources.

Several authors (Palma, 2000: 27; Huerta, 2000:50;142; Martínez, 2000:66) have noted the increasing use of agricultural lands for housing purposes in San Pablo. According to Martínez, houses started to spread in agricultural lands during the sixties, leading to the creation of an "ejido colony". This process did not go unnoticed by Agrarian authorities. A letter dated February 23rd, 1983, addressed to the comisario ejidal and signed by the Head of the Promotoría Agraria No. XV literally reads (our translation): "it is strictly forbidden to build any kind of construction in the working parcels, so the surveillance committee[6] in coordination with municipal authorities must watch that ejidatarios and comuneros do not make bad use their parcels".

San Pablo traditionally obtained water for human use from "ojos de agua" or "pocitos". "There were several of them", says one informant. "Water would come out from many parts" (el agua brotaba de muchas partes). Irrigation waters were obtained from the Texapo spring but during the eighties water for urban use became insufficient and the Texapo waters were entubated and channeled for domestic use.[7] Since then, these spring waters have been used both for urban and agricultural purposes, to the detriment of traditional crops (corn and beans) which receive little or no water.[8] These waters are administered by a committee (comité de agua rodada). Also, a well for was drilled in the early nineties.

The community self-assessment (autodiagnóstico comunitario) conducted by Mata et al (1998:48-49) points to the diminishment and contamination of water sources with agrochemicals, raw sewage and urban waste as well as the intensification of water use for flowers cultivation in greenhouses. Very similar conclusions were reached by Canahua

(1986) and Ramírez (1999). This latter argues that the most important problems of San Pablo according to its own people are the lack of a proper sewage system; the lack of public services; and improper waste management. Accordingly, research carried out by Huerta (2000) on the cultivation of crisantemo in several communities of the watershed, including San Pablo and San Diego, indicates that fifty eight per cent of flower producers have problems of water availability. Since greenhouses are located in the homes, drinking water is being used to water flowers and some people are overusing this resource, thus creating conflicts in the community. Through our own research we could also identify a decrease in irrigation waters for traditional crops such as corn as beans.

San Diego Tlaylotlacan

Historical records indicate that San Diego received its current name in the early eighteenth century from Franciscans living in the region. It resulted from the integration of two previously existing communities: Santa María Tailotlacan and San Diego de Alcalá (Mata et al, 1998:96-98). According to a map of the Chapingo hacienda dated in 1891, the town of San Diego Tlaylotlacan was outside but very near to the limits of the hacienda (González, 1996:63). Local informants stated that their present lands were actually part of the hacienda. The owner would allow them to cultivate corn and beans "a un tercio": at the time of harvest, the produce of two raws (zurcos) were for the hacienda owner and three for the worker.

The ejido of San Diego was created in 1927 and like SPI, it was one of the first in the country. Presently it combines three forms of land ownership: ejido lands (134

hectares), including individual parcels belonging to 112 ejidatarios, one school parcel and one women's parcel; 158 hectares of private property and four hectares of communal land. After Procede, the number of ejidatarios went up to 129.

During the second half of the twentieth century San Diego's population grew very rapidly: from 1,440 habitants in 1970 to 9,230 in 1999, with the largest population increase occurring during the nineties (Table 2). According to Palma (2000:28), this represents an increase of 541% in 29 years and can be attributed to outsiders moving to the community in search of employment opportunities in the Texcoco region.

Major crops in San Diego include rain-fed and irrigated corn, beans, habas, vegetables (lettuce, spinach, acelga, radish, zucchini, green beans, tomato, onion, celery) and flowers (cempoaxóchitl). Family gardens with ornamental and fruit trees are also common. In San Diego we could also perceive the increasing use of agricultural lands for housing purposes. When we asked one informant why he referred to the scarcity of space in the village (our translation): "If I had a place where to build, and land to give to my sons, I would not have built anything in the parcel. But that the only piece of land that I have. My sons already have a family and there is no money to buy more land, so I had to share here".

Drinking water in San Diego is obtained from a well built during the sixties. In turn, irrigation waters are extracted from four wells located in ejido lands, with an average depth of 200 meters each. All four were perforated during the seventies and eighties due to an increasing need of water. In the words of a local informant, "many yeast ago, San Pablo provided San Deigo with waters, both for domestic and irrigation purposes. As time went by, the village grew and water was not enough, so drinking and irrigation wells were built".

Another informant agrees:

Hace muchos años, el agua corrediza que venía de San Pablo Ixayoc, alcanzaba para abastecer

"los pozos" (cisternas) que había en las viviendas y también abastecía de riego (turnos de 4 horas 2 ó 3 veces al año) a las parcelas. Pero después empezó a crecer el pueblo y los terrenos de cultivo sólo tenían riego cuando la seca amenazaba con matar el cultivo. Años después comenzó a llover mucho menos que antes, por eso se empezaron a perforar pozos en San Diego.

Water distribution is organized in "societies of users" (sociedades de usuarios) around each well, whose membership ranges from 20 to 61 individuals Access to water follows strict rules, as described here:

Cada socio debe solicitar con tiempo su agua (turno) y pagarla previamente y si adeudan se les cobran recargos. Cuando un socio se da de baja, por lo general esa acción es comprada por otros socios del mismo pozo; procuramos que no entre a la Sociedad gente nueva, aunque sí puede venderse a socios de otros pozos. Si hay cobros extraordinarios para el pago de energía eléctrica, cada socio paga por cada acción que tenga.

The community's agricultural lands also receive irrigation waters from springs located in San Pablo passing through Santa Maria Nativitas and Tequexquinahuac. This water is stored in ponds which used to belong to the Chapingo hacienda and became the property of San Diego in 1925 by official decree. According to one informant, the majority of *ejidatarios* (sixty to seventy per cent) make use of ponds water. These are administered by a local committee which is also

responsible for keeping the ponds clean and in good shape (Mata et al, 1998:98-101).

San Diego shares with San Pablo some of the problems in land and water quality and use outlined above. Indeed, fifty per cent of all arable lands in San Diego have been eroded (Mata et al, 1998:103) and the urban use of agricultural land is "evident" (Palma, 2000:27). The most important problems detected by Mata et al (1998:103) include the use of agricultural water for urban use and vise versa, water contamination and waste. According to Tejeda (2001), the urban use of water is higher than the agricultural use, in spite of the fact that most wells have been built for irrigation purposes.[9] Conflicts over water between *ejidatarios* and outsiders buying land or making new houses or even among *ejidatarios* building in *ejido* lands are very common. Water contamination is also a serious problem since the community sends its raw sewage to the Texcoc river together with other communities such La Trinidad, San Sebastián and Santa Cruz de Arriba, with a total population of 9,700 people (Gómez et al, 1993:5).

Preliminary Study Results: **Land Use Changes**

Information gathering through our own fieldwork efforts confirmed some of the results of previous community studies, and provided more in-depth knowledge on a variety of issues than was previously available. In this preliminary report we will highlight some of our more significant findings.

As expected from previous studies, the changes to Article 27 did not precipitate an avalanche of land sales in the two *ejidos* under study. Nevertheless, there was evidence of considerable conversion of agricultural land into urban uses, principally housing, but also some commercial enterprises, and primarily in the community of San Diego which borders on the

outer edge of the rapidly expanding city of Texcoco. This development supports the findings of previous studies in Mexico that found most of the land ownership changes in the peri-urban *ejidos*, with very little of this change happening in the more rural *ejidos*.

Another very significant change in land use has been the shift away from a primary emphasis on the production of two rain fed crops, corn and beans, to increasing emphasis on the cultivation of flowers, and to a lesser extent, vegetables with the use of greenhouse technology. The prevailing view was that the traditional crops are no longer profitable, especially so with the case of corn. Crops that typify this new intensive greenhouse agriculture include chrysanthemums, tulips, lilies and a few other local varieties. These are usually sold to wholesalers in the markets of Mexico City. In the community of San Pablo alone some 90 greenhouse units were reported to exist by our respondents.

These two developments would appear to be the most significant newer factors that have impacted the environment more generally, and water resources most specifically. Briefly, we shall indicate how this has occurred.

The Impact on the Environment

Our comparative study of two *ejidos* in different geographic situations provides insights into how different locational factors will influence outcomes as far as the environment is concerned. In the case of the community located farthest up the mountain away from Texcoco city - San Pablo - the environmental impacts were rooted in changes in agricultural land use, and in demographic pressure. The community largely relied on water from a major spring for irrigation until 1990. Water was used for irrigation during the day and for domestic use at night.

Respondents reported that as greenhouses were built, water for domestic uses became scarce. In 1990, as a result of a water shortage a well was drilled for domestic use, with residual water to be used for irrigation in the nearby community of Nativitas.. This solved the problem for a while. However, since 1995 shortages for domestic use have reappeared, especially for those with homes in more marginal and higher lands in the *ejido*.

An important observation of respondents was that since the digging of the well, significant springs and wetlands, which fed into the river, have dried up. One respondent noted that since 1998 there has been an ever larger water scarcity. At present it was reported that potable water is suspended to homes on almost a daily basis.

Of the reasons given for the increasingly severe water shortages, the building of the greenhouses in recent years was given as the primary reason by the great majority (85%) of respondents. This was because the crops they produced were watered "all the time" or "very often", and the flower crops are grown all year long as well. It was noted that greenhouse owners typically had cisterns for storing water during the dry season, while domestic dwellings did not have water at that time. Other reasons given for the scarcity of water in recent years centred on problems of management of the water committee, and the fact that people did not pay for the water they used (and presumably had little incentive to husband water resources).

In the community of San Diego water problems started years earlier, in the 1970's. Prior to that there was sufficient water provided by the springs in the community of San Pablo farther up the mountain. The community stored water in a reservoir and this was sufficient for community needs. The rapid growth of the community, and the growing scarcity of water coming down from San Pablo, and its increasing contamination, necessitated the digging of

wells in the last three decades however.

In this community water rights from most of the well have to be bought, and it cost 40 pesos for four hours of use every two weeks. Extra water use is charged three times this rate. Here as well, respondents reported that green houses growing flowers and vegetables used the most water, and the traditional corn and bean crops the least. In addition to problems receiving the water from the San Pablo *ejido* they once received, there was also reported problems with another community, Nativitas, tapping into the water that fed San Diego's reservoir, exacerbating water scarcity for the latter community. In San Diego there were also reports of people illegally using water designated for domestic use to grow vegetable crops.

In this community it became apparent that administrative problems were exacerbating water shortages and the general community anxiety over water. Although each well is supposed to have a committee to oversee water use and the charging of fees, few of these were reported to be functioning properly. Moreover, the *Comisario Ejidal* that manages the overall *ejido* has had administrative difficulties, with the *Comisario* been ousted for reported mis-management of resources. Part of the problem appeared to be that the *Comisario* had not organized residents in the usual annual work brigades needed to accomplish the varios *faenas* or tasks that had to be done to maintain the irrigation and water channels and storage facilities in good conditions. As a result much water was being wasted. At the time of the study an interim commission was directing the *ejido* and had concrete plans to begin to rejuvinate the water infrastructure of the *ejido*[10].

In addition to issues related to water, our study provided evidence that the conversion to greenhouse technology and the intensive production of flowers and vegetables brought with it

the increasing use of chemical pesticides where at an earlier time these were almost unheard of in the communities. Respondents reported contamination of water courses with the residues from these pesticides.

With respect to water contamination more generally, there was ample evidence from both interviews and from direct observation of the research team that rivers and streams were being used by the communities as dumping grounds for all manner of wastes, whether domestic or farm related. This notably included raw sewage from domestic establishments because adequate septic systems or treatment plants were entirely lacking, to the extent that during the dry season rivers and streams appeared to be little more than running open sewers. The general community neglect of the health of rivers and streams was striking and disturbing.

Tentative Conclusions:

Preliminary analysis of data from our investigation, together with the findings of other studies in this region, indicates that the effects of neo-liberal policies in Mexico, and reform of Article 27 of the Constitution in particular on land use and the environment must be put in the context of more long standing changes in rural Mexico. These changes are both socio-economic and demographic.

While there was evidence of a definite conversion of land in the San Diego case to urban housing development in the 1990's, it was not clear whether the reforms to Article 27 affecting *ejidal* land were directly responsible. Some of this had reportedly been done illegally before 1992 anyway, and this process likely continued under the strong pressure provided by the rapidly expanding Texcoco city. There was good evidence that the broader impact of neo-liberal

reforms that had undermined the price of traditional domestic crops, especially corn and beans, was forcing residents to consider different options. For those who wanted to stay in agricultural production, predominantly males, the only profitable options were flower and to a lesser extent vegetable production for the urban market, and using green house technology. This agricultural conversion, which took place in both communities, had negative repercussions for scarce water resources. Not only did it help to exacerbate scarcity (together with demographic growth and possibly declining annual precipitation as well) but it has been associated with the introduction of pesticides into the farming regime and resulting contamination of waterways.

Other factors were at work undermining the ability of communities to husband water resources however. These were largely organizational, but were rooted to some extent in wider societal changes. While mismanagement of the communal resources by the directive committees may not have been a particularly new phenomenon, it was clear, especially the case of San Diego, that the penetration of the market economy, the integration of residents into paid employments often outside the community was having a corrosive effect on the ability of the *ejido* to continue to mobilize its residents to do the variety of tasks that were required for the healthy reproduction of the *ejido* unit from one year to the next. The careful husbanding of water resources was a leading example of this failure.

In the case of water, the general understanding in the communities was that they were also a victim of a broader process of climate change affecting this part of Mexico and likely linked to rapid depletion of regional forests, among other factors.

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Endnotes

1. The research team would like to gratefully acknowledge funding coming from the Canadian International Development Agency through the INSTRUCT project at Trent University, Canada.

2. These arguments by Lopez and Ovalle were originally made in the early 1990's in a series of newspaper articles, recently republished together in a compendium.

3. Poor land quality was a problem not only in San Pablo, but also in many other communities of the region. For details see Recio (1973). In our interviews many people told us that, in fact, their land was not very productive. According to one informant, people were used to buying corn because theirs was "yellow" and "did not grow". They obtained the money they needed to buy corn from the extraction and sale of forest resources, mostly firewood. The introduction of agrochemicals during the fifties contributed to higher corn yields.

4. As will be seen shortly, people started to build houses in agricultural lands during the sixties. In this same decade, these houses were considered private property and their owners had to pay property taxes (*impuesto predial*) for having them.

5. According to Oropeza (1992:2), eighty per cent of the original vegetation of the watershed was destroyed during the seventies and eighties due to logging practices, sobrepastoreo, explotación de minas de arena para la construcción y mal manejo del suelo (TRANSLATE). Research on soil quality conducted during these two decades indicates that soil erosion is higher in the mid and upper regions of the watershed (Figueroa, 1975; Terrazas, 1977; Rodríguez, 1982). For the importance of terraces to prevent erosion, see Ruiz (1979).

6. *Ejidos* are ruled by a *comisariado,* a secretary and a treasurer. The "surveillance committee" supervises the work and activities of these three people.

7. According to one informant the Texapo spring used to produce 19 liters per second (no exact date was provided). A study conducted in the early nineties found that the spring was producing only 10 liters per second.

8. According to one informant, during the eighties *ejidatarios* watered from ten to 18 hours a day. In the late eighties the quota was reduced to twelve hours and in the early nineties to three hours only. Figures vary from one person to the next, but they all coincide in that the amount of hours have been reduced. More importantly, interviewed people agree that the present quota does not meet their needs, so they have come to consider their parcels to be rain-fed rather than irrigated.

9.According to Tejeda (2001), urban use of water (including drug stores, papelerías, grocery stores, meat shops, laundry shops, electronic mills, *tortillerías*, schools and houses) amounts to 250, 025 cubic meters a year, while agricultural use (including greenhouses, forrajes and vegetables) represents 70, 931 cubic meters a year. The author also notes significant water waste

in irrigation practices.

10. These were detailed to the research team in a special meeting held with members of the interim committee in June, 2003.